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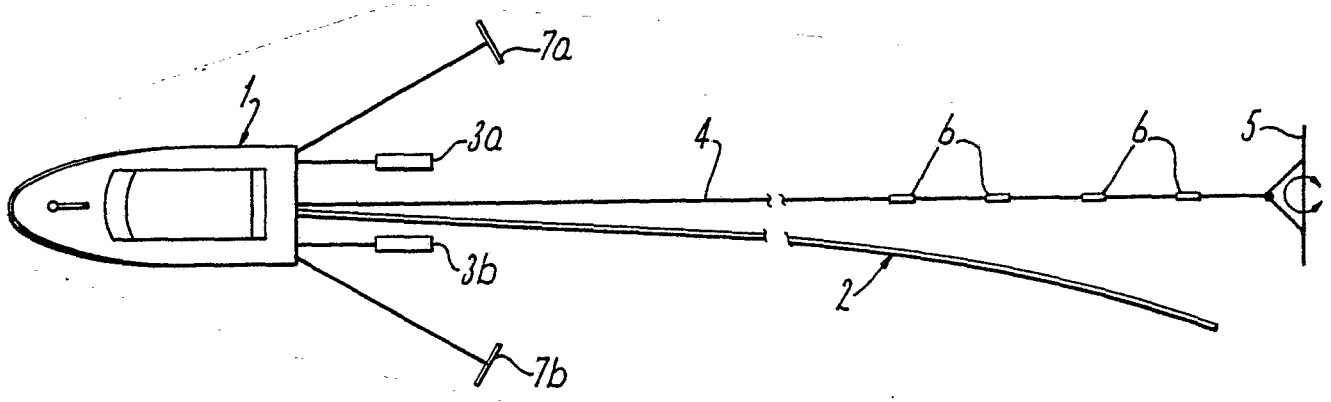

(57) Abstract

A device in a hydrophone cable which in connection with seismic surveys is towed through the water behind a vessel, the hydrophone cable comprising means for detecting echo signals which are reflected from the sea bed and various layers therebelow. For the purpose of improving the determination of the position of the hydrophone cable which can have a length of approx. 3000 meters, a transmission system is suggested, which comprises transmission elements arranged outside the hydrophone cable itself, the transmission elements serving to determine the position of the hydrophone cable in relation to the elements. In a simple embodiment of the device according to the invention the transmission elements are attached to or are constituted by a separate towing line (4) having a relatively small diameter, the towing line being equipped with stretching means (5) for achieving a relatively straight run. In an alternative embodiment the transmission elements can be implemented as reflectors (9a-9n) for preferably electromagnetic waves, for example in the form of light gas-filled balloons which can be attached to the hydrophone cable via thin, light lines, so that the balloons can be towed at surface positionor fairly high above the water surface. The transmission elements can also be included in a conventional

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Device in a hydrophone cable for marine seismic surveys

The present invention relates to a device in a hydrophone cable which is adapted for marine seismic surveys and is towed through the water behind a vessel, the cable comprising means for detecting echo signals from the sea bed and various layers therebelow.

Such hydrophone cables which are used in connection with seismic methods for mapping possible hydrocarbon sources below the sea bed, can be approx. 3000 meters long and be towed at a depth of approx. 10 meters. At a distance of approx. 100 meters behind the vessel there are also towed so-called air guns, the air guns firing shots according to an appropriate programme. The sound waves which are transmitted from the air guns, are reflected from the obstacles against which they may impinge below the water surface, as well as from the sea bed and various layers therebelow. The echo signals which return to the hydrophone cable, are detected by a series of hydrophones which are arranged along the cable, and which after a suitable conversion transfer the echo signals via the cable to an appropriate processing device on the towing vessel.

The seismic methods can be carried out by firing lines having a mutual distance of approx. 50 meters, and the intervals between the shots from the air guns correspond to a distance of approx. 25 meters, for thereby achieving a very fine net of squares.

Aside from comprising means for detecting echo signals from the water bottom and various layers therebelow, the hydrophone cable also comprises a plurality of compasses which indicate the form of the cable during the towing operation, and which thus constitute reference points for the line to which a sweep operation is to be referred. However, such compasses suffer from some disadvantages, the direction indication of the compasses being apt to give significant errors, since the hydrophone cable has a substantial extension.

Besides, the compass section of the cable is often significantly larger in diameter than the cable itself, and will therefore in itself be prone to generate noise. Further, the compasses necessitate a substantial number of surplus connections in the cable, which in itself is unfavourable. Further, the calibrating routine for the compasses is very sophisticated, and it is not unusual that several days are used for effecting the calibration and making all of the compass sections operable. In case magnet compasses are used, these may easily be disturbed by the magnetic fields occurring during the measuring work itself.

In connection with such known magnet compass hydrophone cables no direct visual indication of the position of the cable exists other than an end buoy which is towed freely at an arbitrary position approx. 200-300 meters behind the terminal of the hydrophone cable.

Other and more reliable and stable direction references than magnet compasses have been evaluated, for example gyro compasses, but these have not been in commercial use, since it is expected that they will constitute a means which makes the hydrophone cable more expensive.

The object of the present invention is to arrive at a device in a hydrophone cable which with simpler and less expensive means can determine the position of the hydrophone cable, the detection of the hydrophone cable's position being of importance not only during the sailing of the measuring lines itself, but also during the turning programmes after a terminated line, in connection with which significant extra distances have to be sailed before a new line is entered for thereby ensuring that the cable has a shape as straight as possible.

The object is achieved according to the invention in a device which is characterized in that it comprises a transmission system which is adapted to determine the position of the hydrophone cable, and which comprises transmission elements provided outside the hydrophone cable itself.

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